

IMPLEMENTATION OF MICROLEARNING IN THE MARITIME ENGLISH LEARNING AT SENIOR COURSES (INVOLVING VIRTUAL REALITY TECHNOLOGIES)

Article reveals the ways of implementing a modern educational paradigm – «microlearning» – in study of maritime English for students at senior courses.

The main idea of research is that the educational content can be structuralized with educational patterns – «nuggets» – of different levels according to time, size and complexity. It not only enables faster understanding and mastering of the material, the paradigm is focused on actualizing the knowledge accumulated within previously realized nuggets. According to the core principles of microlearning we've singled out five basic educational nuggets necessary for topic mastering: class learning nugget, e-learning nugget, mobile learning nugget, deep learning nugget and VR learning nugget. Class learning nugget represents the formal area of microlearning, characterized with step-by-step learning and achieving the learning goal. E-learning and VR learning nuggets introduce non-formal area of microlearning, revealed in flexible ways of learning on the basis of digital electronic environment. Mobile learning and deep learning nuggets form informal area of microlearning, being the most productive ones due to the active role of student being provoked and motivated by an instructor by means of social networks.

To demonstrate the ways of «nuggets» technique application to the study process we've represented a detailed lessons planning within an author's module, describing types of learning nuggets, format of interaction and levels of nuggets realization. Such combinatorics of educational patterns of micro and meso-levels enables to achieve the educational goal of macro-level.

The research comes to the idea that steady rotation of educational nuggets within traditional, electronic and virtual learning allows to achieve in full the principle of «continuous education» on the condition that such learning process is dispensed and controlled by the instructor on each level.

INTRODUCTION

The rapid dynamics of information and knowledge flow requires dynamic changes in the field of education. New information technologies dictate new conditions of the teaching and learning process. In this regard, the focus of attention shifts to the student (student-oriented learning), the addressee of the educational process, who has used to receive relevant information and knowledge through the online environment.

These changes have become a challenge not only for the traditional, but also for the blended educational system. Uptaking of large volumes of information by students both during classroom classes and through electronic media does not give the desired results, because it is mainly focused on the development of short-term memory. On the other hand, there is a problem of instructors' passivity regarding the involvement of new methods and information technologies in the learning process. As a result, we have a low level of students' interest in learning, being focused on obtaining passing grades rather

than on acquiring knowledge. This problem is especially acute when learning a foreign language, which requires constant practice and improvement. Especially if this language is a tool of professional activity, for example, of maritime officers.

The solution to this problem lies in the introduction of the modern technique of «microlearning» into the educational process, arising as the newest educational paradigm, which allows an instructor to divide the material into portions and integrate the most current media and technologies for its effective uptaking and mastering. At the same time, its ultimate goal is to stimulate the «continuous education».

The **aim** of the article is to highlight the theoretical and practical foundations of the «microlearning» paradigm implementation in the teaching process of maritime English at senior courses. In order to achieve the final aim, it is necessary to solve a number of **tasks**, namely: give an interpretation of the «microlearning» concept, highlight its key principles and tools of implementation, consider the hierarchy of educational units at the disposal of micro-learning, characterize the basic units used in structuring the educational process of maritime English teaching at senior courses, present combinatorics of educational structures of different levels on the example of the author's worked out module.

THEORETICAL FUNDAMENTALS

«Microlearning» [14] is a new learning paradigm that has been successfully used in the field of e-learning. Its main advantage is the combination of small volumes of educational content together with the flexibility of technologies and the creativity of the instructor.

It is exactly the micro-learning that is the mechanism uniting three areas of modern education – formal or traditional, informal and informative [7, 19].

In terms of the formal field of education, the «microlearning» is interpreted as learning in small steps [1] and with small units of content and structure («nuggets» [2, 9, 10] or «bursts» [6] or «micro units» [3, 14]), aimed at achieving one learning goal at a time. The tools for achieving this goal remain primarily methods of blended learning.

The informal side of microlearning lies in its flexibility and accessibility, namely the absence of strict traditional learning formats – students learn at a pace convenient for them, using various e-learning platforms, having constant access to relevant information and tasks even from mobile gadgets.

The informative aspect of microlearning as a self-directed and personalized process lies in its productivity in social networks, in searching for additional information in Google and Wikipedia, in exchanging information on assignments in messengers, reading articles on a topic and watching video materials on Youtube, etc.

Thus, «microlearning» appears to be a promising approach to e-learning with an emphasis on its informative aspect, oriented towards the learning of senior students, self-study and «continuous learning».

This approach does not have clear boundaries and can vary depending on such variables as time, content, curriculum, form, process, tool, educational type [14]. Therefore, traditional microlearning, as opposed to «nanolearning» [5], refers to short-term focused learning activities without specific time frames.

Having analyzed the theoretical achievements of microlearning among leading foreign scientists [4, 5, 14, 16], the following **principles** have been highlighted:

- each micro unit should focus on one educational goal;
- such micro units should function as separate blocks that are easy to operate for building meso- and macro-level educational structures;
- micro units should include positive feedback upon completion;
- micro units should be organized in such a way as to provoke interest in the search for additional information;
- video and audio materials should (preferably) not exceed ten minutes, but time limits should not affect the educational content.

According to the technique of microlearning [14], the educational content is structured into educational patterns of different levels according to the categories of time, size and complexity. Thus, micro-level learning structures are elementary patterns that, in various combinations, can be used to build more complex meso- and macro-level structures that can be compared with the lesson and course.

Regardless of the level, each of the patterns is subordinate to its educational goal. From this position, it is appropriate to draw a parallel with the competence-based approach to learning [17], where each acquired competence complements the previous one and forms the basis for the next one like a «snowball». Therefore, without achieving the goal of micro-level structures, it is not possible to achieve the goals of the lesson, and as a result of the entire course.

For example, the module on the topic «Ship Routine Maintenance» has a final macro-level learning goal «you'll be able to give clear instructions to provide routine ship maintenance and inspection», which is achieved through the progress of a number of meso-level learning goals at the end of the lessons: «you'll be able to demonstrate knowledge of documents and certificates required to be onboard of different ships», «you'll be able to determine rules of life-saving and fire fighting appliances maintenance», «you'll be able to characterize in details cargo gear routine maintenance and navigation equipment readiness» etc. During the lesson, a series of interactions of micro-level units will be involved, each of which will also be aimed at fulfilling its micro-goal: «you'll be able to identify the life-saving appliances onboard», «you'll be able to name the life-saving appliances you've seen onboard», «you'll be able to describe the function of life-saving appliances you've seen onboard», «you'll be able to present the life-saving appliances required to be used onboard», etc.

In order to achieve the educational goal, various modern media **tools** can be used according to the content. Among the key ones, we should highlight video materials on YouTube and Instagram, slides and presentations in PowerPoint, cards and drawings on Canva, questionnaires (checklists), blogs and posts on social networks such as Twitter and Facebook, informative articles on Wikipedia pages, solving problem situations and debates in chats (Telegramm, Whatsapp, Viber, etc.), discussions by email, links to electronic educational resources with various tasks (Moodle) for deep immersion and mastering, study of cases, role-playing games, stimulating exercises, etc.

Another effective microlearning tool is a virtual reality simulator. VR technologies have the potential to convey educational content vividly, with the possibility of practical training of skills, and in comparison with traditional methods, provide a high level of realism and immersion in the virtual environment [19, 36]. According to the principle of «immersion»,

all VR stimulators are divided into visualization tools (not able to provide «immersion») and interactive tools (provide full «immersion») [20, 4].

Any VR stimulator is tied to special software that meets the goals of the subject of study and requires a constant control. During training, the instructor takes the role of a supervisor, controlling the procedure and the safety of the students.

In our opinion, it is the stimulator of projected virtual reality that is the most effective in the framework of micro-learning, because it implements interactive content of any topic (for example, for the training of maritime officers [15]) and enables various formats of student interaction (individual / pair or group) under passing time. This simulator consists of a moving avatar that reflects the user's movements in real time and is visualized on a wide screen. The software and hardware complex of this stimulator includes a virtual reality helmet, controllers and the interactive content. These tools enable user interaction with virtual objects [18].

After analyzing the theoretical achievements of «microlearning» [4, 5, 14, 16], it has been concluded that the use of the «nugget» technique makes it possible to achieve «continuous learning» principles. According to this technique, the educational content is structured in the form of small adaptive units – «nuggets» [12, 2]. Following R. Horst, we interpret «nugget» as an elementary autonomous educational unit that can be implemented separately or, in combination with other nuggets, to create more complex educational structures.

In view of the above, there is a need for a comprehensive coverage of all educational nuggets as the basic units of structuring the educational process in the light of microlearning.

PRACTICAL ISSUES

Basing on the key principles of microlearning, we've identified the main educational structures involved in the transfer and actualization of knowledge during the educational process, which can be implemented at any level (Fig. 1.).

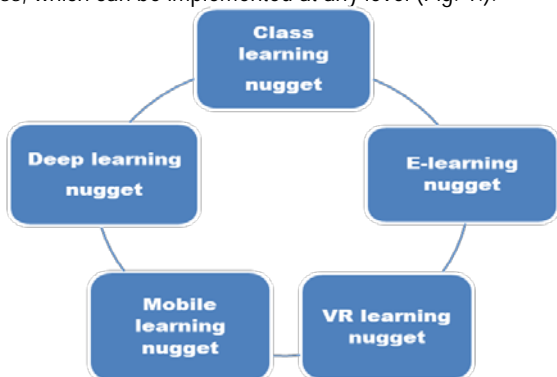


Fig. 1. Basic principles of structuring the educational process

A «class learning nugget» can represent a complex meso-level structure – a lesson, which consists of a number of micro-level nuggets, or it can be implemented by any traditional micro-level learning tool aimed at achieving one micro-learning goal. For

example, from the topic «Types of tankers», the micro goal sounds like this – «you will be able to name the types of tankers according to size», and the meso goal of this structure will be broader – «you will be able to present (describe) all types of tankers according to size / cargo / design».

After many years of implementing a communicative and competent approach to teaching maritime English, we believe that this approach is the best suited to the realization of the traditional / class learning nugget. The principles of microlearning and the communicative and competent approach to learning have many common features that complement each other:

1) student-oriented learning (appeal to real life and professional situations, acquired skills);

2) communication both in the audience during practical classes and outside (in real time and social networks) is in the focus of attention;

3) active involvement of group and pair work format, which allows to find a solution to the problem where the individual himself is unable;

4) a hierarchical structure of learning: large topics are divided into modules, which in turn are divided into separate units – lessons, where each one is aimed at achieving its specific goal and is interconnected with others;

5) step-by-step mastery of communicative competences;

6) active use of tasks that «provoke / stimulate to action» (problem situations, round tables, cases, role-playing games, discussions, imitation exercises);

7) assessment of the acquired competences at the end of each module and analysis of the results.

For example, the goal of traditional learning nugget of micro-level, implemented with the help of video material, will include three mandatory stages – actualizing the student's background knowledge before watching the video (pre-watching), forming skills while watching (while-watching) and consolidating skills after watching (post-watching). At the same time, all three stages are subordinated to the single micro goal of this nugget.

«E-learning nugget» provides dosed and controlled access of users to micro-content at the expense of the learning management system. One of these systems is the electronic digital environment Moodle, which enables quick display of educational courses on any gadgets. At that, the author's training courses are a supplement to classes aimed not only at deepening knowledge on a separate topic, but also at increasing interest in discussion outside the classroom (video and audio materials on discussion topics, cases for group discussion of problem situations, illustrations with tasks for development of critical thinking, game exercises for consolidating the material, reproducing situations, collaborative projects, etc).

Micro-level e-learning nugget can be implemented by short training exercises like «multiple-choice tests» – short answers based on statements or texts, «yes/no tests» or «matching tests» (true/false tests) – short answers used in reading and listening, rearrangement tests, «gap-filling tests» or «short answers». The above types of tests are always presented in combinations with illustrations, video and audio materials (listening – multiple-choice tests, reading – yes/no tests, watching – gap-filling), which are as close as possible to real communication conditions.

It is important that the sequence of such micro-interactions does not overload the user with information. That is why it is appropriate to involve no more than one or two e-learning nuggets. For example, a link to a current article or news on a topic followed by discussion in a forum (one of the tools in Moodle) or a short video followed by «compliance tests».

Also, the e-learning nugget can be implemented within the framework of collaborative projects, using online conference programs such as Zoom or Skype. The same tools are effective for short online discussions or debates on current topics under the guidance of the instructor, being another example of the e-learning nugget implementation in the educational process.

«**Mobile learning nugget**» is an effective training pattern due to convenience and ease of its implementation, which makes training more personalized and motivated. This goal is realized at the expense of collaborative educational environments such as Facebook, Instagram, Twitter, which enable the creation of thematic posts and hashtags, active exchange of opinions and photos, sharing links to current articles and news, responding to comments and engage in discussions, etc.

Another example of a collaborative educational environment is group chats such as Telegram, WhatsApp, Viber, which are effective information platforms for the implementation of the mobile learning nugget. The latter can be represented in the form of a discussion on a problematic situation or a provocative question, a reaction with an exchange of opinions on a certain event (in an area important to students), etc. Basing on the experience of implementing the mobile learning nugget in the teaching of maritime English, we emphasize the effectiveness of its daily use as an important addition to each topic, which stimulates students to search for new information and self-study. For example, during the discussion of small cases (authentic texts on a current topic with controversial issues) in the chat group, in order to defend their own opinions, students had to refer to official maritime conventions or codes, quote provisions, exchange links to current data, etc. It should be noted that the instructor takes an active role: he/she constantly promotes microlearning, provoking students to react and actively participating in dialogues and discussions by himself/herself.

«**Deep learning nugget**» allows you to analyze large amounts of information, critically interpret new facts and ideas, establish cause-and-effect relationships between events, and draw parallels between the content of the course and the practical implementation of knowledge in real life.

The implementation of the deep learning nugget in the teaching of maritime English was carried out primarily with the help of cases. At the micro-level, this nugget was implemented with small cases with provocative content that required further independent search and analysis of information followed by discussion in groups or pairs (in chats or video conferences). At the meso-level, the author's case-lessons were built: a large authentic text on a relevant topic was divided by content into thematically united micro parts, each one included certain tasks for the development of critical thinking and was aimed at achieving one educational goal. Such classes are effective both in the classroom and online, can be organized at the initiative of an instructor and a group of students, should be short in duration (no more than an hour) and aimed at solving a certain problem situation

(establishing cause-and-effect relationships of an incident, highlighting the chain of events that preceded it, discussing the actions that should have been taken to avoid the incident).

«**Virtual reality learning nugget**» (VR learning nugget) enables practical performance of professional tasks on a virtual reality platform in order to gain real experience.

Using R. Horst's VR patterns [8, 10], the VR learning nugget of micro-level can be represented as «show and tell» nugget and implemented during the educational process in the format of a certain 3D model presentation (for example, the model of freefall lifeboat for maritime officers), as a «compare» nugget – a comparison of several models (comparison of vessel types), as a «chronological sequence» nugget – reproduction of the algorithm of actions (when working with certain equipment), as a «dynamic structure» nugget (vessel design analysis) or «setting» nugget (demonstration of container fastening types directly during and upon completion of the download operation), etc.

Basing on the experience of implementing training on the VR simulator in the teaching of maritime English, it has been found that the content of virtual training may differ in terms of target orientation. The current training is focused on mastering the acquired skills and includes the step-by-step training of any operation on the vessel according to the commands. Such conditions of the virtual environment are as close as possible to the real process of gaining experience on the ship, when the cadet executes direct commands and makes the necessary decisions in a controlled manner in accordance with previously formed skills. The current going through has an infinite number of attempts and is unlimited. A complex procedure should be divided into a number of micro-level steps for better understanding. The final going through aims to demonstrate the level of acquired competence and represents the implementation of the meso-level VR nugget. The student's actions are limited in time, he acts without prompts, relying on his own knowledge and skills. During the final going through of a certain operation on the VR simulator, the student must comment on each action, using the terminology of maritime English (Fig. 2).

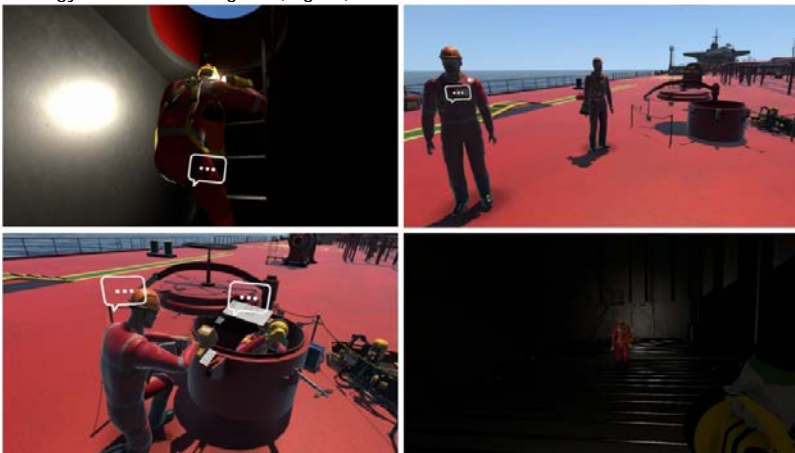


Fig. 2. «Enclosed space entry» procedure on the VR simulator

The VR nugget of meso-level can be implemented not only in an individual format. During the final going through a certain operation, the student's actions are displayed on a large screen, which allows other students to work in groups or pairs, discussing each step and commenting on the appropriateness / inappropriateness of the actions in the given situation. Under this condition, the role of the instructor can shift to the students, who analyze and compare the user's actions, the lexical units used to describe every step and grammar tenses applied for it, fill out checklists and work on mistakes together.

Thus, the involvement of VR learning nugget allows to immerse the student in conditions as close as possible to his professional ones, not only to demonstrate modern equipment from the future workplace, but also to provide practical experience of professional procedures and operations.

In order to demonstrate ways of implementing the microlearning into the everyday educational process at senior courses, we've developed an example of lessons' planning within one of the author's modules for teaching maritime English (Table 1.). As indicated in the table below, we've combined the nuggets of different levels into complex learning patterns that effectively integrate traditional, electronic and virtual learning.

Table 1. Combinatorics of «nuggets» of different levels within the author's module in maritime English «Ship Routine Maintenance»

Module «Ship Routine Maintenance»	Type of learning nugget	Format of interaction	Nugget Level
			Macro level
Lesson 1 «Ship General Inspection and Maintenance»	Class learning nugget	Class learning (face-to-face)	Meso level
	E-learning nugget	Electronic learning (out-of-class)	Micro level
	Mobile learning nugget	Mobile learning (out-of-class)	Micro level
Lesson 2 «Documents Verification»	Class learning nugget	Class learning (face-to-face)	Meso level
	Deep learning nugget	Electronic learning (out-of-class)	Micro level
	Mobile learning nugget	Mobile learning (out-of-class)	Micro level
Lesson 3 «Certificates Validity Control»	Class learning nugget	Class learning (face-to-face)	Meso level
	E-learning nugget	Home / Electronic learning	Micro level
	Mobile learning nugget	Mobile learning (out-of-class)	Micro level
Lesson 4 «Life Saving Appliances	Class learning nugget	Class learning (face-to-face)	Micro level
	VR learning	Electronic learning	Micro level

Maintenance»	nugget	(in-class)	
	E-learning nugget	Electronic learning (in-class)	Micro level
	Mobile learning nugget	Mobile learning (out-of-class)	Micro level
Lesson 5 «Drills Arrangements and Records»	Class learning nugget	Class learning (face-to-face)	Meso level
	Deep / E-learning nugget	Electronic learning (out-of-class)	Micro level
	Mobile learning nugget	Mobile learning (out-of-class)	Micro level
Lesson 6 «Fire Fighting Appliances Maintenance»	Class learning nugget	Class learning (face-to-face)	Micro level
	VR learning nugget	Electronic learning (in-class)	Micro level
	E-learning nugget	Electronic learning (in-class)	Micro level
	Mobile learning nugget	Mobile learning (out-of-class)	Micro level
Lesson 7 «Fire Fighting Equipment Testing»	Class learning nugget	Class learning (face-to-face)	Meso level
	Deep / E-learning nugget	Electronic learning (out-of-class)	Micro level
	Mobile learning nugget	Mobile learning (out-of-class)	Micro level
Lesson 8 «Hull and Cargo Gear Maintenance»	Class learning nugget	Class learning (face-to-face)	Micro level
	VR learning nugget	Electronic learning (in-class)	Micro level
	E-learning nugget	Electronic learning (in-class)	Micro level
	Mobile learning nugget	Mobile learning (out-of-class)	Micro level
Lesson 9 «Ship Construction and Cargo Gear Deficiencies»	Class learning nugget	Class learning (face-to-face)	Micro level
	VR learning nugget	Electronic learning (in-class)	Micro level
	Deep learning nugget	Electronic learning (in-class)	Micro level
	Mobile learning nugget	Mobile learning (out-of-class)	Micro level
Lesson 10 «Navigation and	Class learning nugget	Class learning (face-to-face)	Meso level

Radio Communication Equipment Maintenance»	E-learning nugget	Electronic learning (out-of-class)	Micro level
	Mobile learning nugget	Mobile learning (out-of-class)	Micro level
Lesson 11 «Ship Navigation and Communication Equipment Deficiencies»	Deep learning nugget	Class learning (face-to-face)	Meso level
	E-learning nugget	Electronic learning (out-of-class)	Micro level
	Mobile learning nugget	Mobile learning (out-of-class)	Micro level
Competency Evaluation	E-learning nugget	Electronic learning (home testing)	Meso level
	Class learning nugget	Face-to-face (in-class interview)	Meso level
	VR learning nugget	Electronic learning (in-class)	Meso level

The foundation for acquiring basic competencies is the implementation of the «class learning nugget» at the meso- and micro-level within the framework of a communicative and competence approach in a face-to-face format. Involvement of «e-learning nugget» and «deep learning nugget» of the micro level should always vary according to the topic and complement it, motivate students to search for information and discuss it outside the classroom. «VR learning nugget» is also implemented at the micro-level according to the topic of the lesson during the current going through and at the meso-level – during the final going through. The use of the «mobile learning nugget» in micro-level is, in our opinion, an integral part of every topic of the lesson, because it updates the student's cognitive base in his free time and stimulates further search for information or exchange of ideas, creating in such way prerequisites for continuous learning.

The summative assessment of the student's level of competence in maritime English for each module takes place in accordance with three areas of microlearning:

- 1) remote (online) passing of tests of various formats on the basis of the Moodle electronic digital environment in order to check both lexical and grammatical skills, as well as professional knowledge of the topic (access to the tests is limited by time frames);
- 2) interview passing with an instructor in the form of discussion or debates on the topics of the module, which simulates the real conditions of a professional interview for employment as much as possible;
- 3) final demonstration of skills on the VR simulator with the involvement of maritime English terminology while commenting on all the student's actions.

Thus, for the effective achievement of educational goals, the formal, informal and informative areas of microlearning should be reflected both in the educational process and during its final assessment.

CONCLUSIONS

The implementation of the educational paradigm of «microlearning» in the teaching of maritime English not only reforms the traditional system of blended learning, it acts as a

constant catalyst and motivator. Microlearning allows you to immerse the student deeply in the topic, focusing his attention on the necessary tasks, agitating for discussion in problematic situations or current news of the maritime industry, etc.

The educational process structuring in the classroom and outside it with the help of educational nuggets of different levels allows to make it as flexible as possible and to achieve the principles of «continuous education». A key role is assigned to the daily implementation of mobile learning nuggets – discussions in chats and forums, comments on social networks, links to current information on the topic, etc. At the same time, VR learning nuggets' opportunities make it possible to acquire practical skills on topics without leaving the educational establishment. Involvement of deep learning nuggets promotes the development of critical thinking and actualizes the cognitive base of students within the material learned and the experience gained during sea practice. The nuggets of traditional and e-learning are basic in obtaining knowledge on topics, providing that they are implemented within the framework of a communicative and competence approach.

Combinatorics of nuggets within any topic should be oriented towards the effective achievement of the final educational goal, correspond to the key principles of microlearning and motivate students to acquire knowledge on their own.

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